

TABLE AP1-1. 7- AND 3-BAR ECM APPROVED FOR NEW CONSTRUCTION
6 January 2011

DRAWING NO. (NOTE 1)	DRAWING DATE	DESCRIPTION (1)	DESIGN AGENT	DDESB APPROVAL DATE	ECM DESIGNATION	COMMENTS: (Notes 2 and 3)
10400001 through 10400027	5-Jan-04	RC Box, Type M	NAVFAC	1-Dec-99	7-Bar	Internal dimensions are 81' wide by 124' long by 24' 6" high (measured at interior face at each side wall). The design provides for 2 entrances on the headwall. Each door measures 14' 8" wide by 14' 2" high. The design provides for internal magazine access by rail and truck. Sited for 350,000 pounds NEW. This drawing number represents the most recent design of three versions of the Box Type M Magazine that have been constructed. The initial design was approved by DDESB-KO memo of 9 Apr 93 for construction at NAVWPNSTA Seal Beach. Two subsequent design variations were approved by DDESB-KO memo of 1 Dec 99, for construction at NAVWPNSTA Yorktown. All new construction of Box Type M ECM will be in accordance with drawings 10400001 through 10400027.
14004689 through 14004720	15-Dec-10	RC Box, Type C (without loading dock)	NAVFAC	4-Jan-11	7-Bar	This design supercedes 1404430 through 1404444 (see Table AP 1-2). Internal dimensions are 50' deep by 94' 8" wide by 13' 8" (rear of magazine) to 15' 10" (front of magazine) high. Three (3) entrances are provided on the headwall. Each of the 3 sliding doors measures 26' 6" wide by 12' high. Sited for 350,000 pounds NEW. Original DDESB approval of 11 May 85 for this magazine design. DDESB memo of 2 February 2006 approved an increase of the maximum, allowable NEW to 500,000 lbs of HD 1.1. This design does not include explosion-proof electrical installation/equipment. If the design is to be used where there is a potential for an internal explosive/flammable hazardous environment, then significant electrical redesign will be required as well as subsequent DDESB review/approval of that redesign prior to construction/use.
14005091 through 14005122	15-Dec-10	RC Box, Type C (with loading dock)	NAVFAC	4-Jan-11	7-Bar	This design supercedes 1404430 through 1404444 (see Table AP 1-2). Internal dimensions are 50' deep by 94' 8" wide by 13' 8" (rear of magazine) to 15' 10" (front of magazine) high. Three (3) entrances are provided on the headwall. Each of the 3 sliding doors measures 26' 6" wide by 12' high. Sited for 350,000 pounds NEW. Original DDESB approval of 11 May 85 for this magazine design. DDESB memo of 2 February 2006 approved an increase of the maximum, allowable NEW to 500,000 lbs of HD 1.1. This design does not include explosion-proof electrical installation/equipment. If the design is to be used where there is a potential for an internal explosive/flammable hazardous environment, then significant electrical redesign will be required as well as subsequent DDESB review/approval of that redesign prior to construction/use.
1404310 through 1404324	12-Sep-83	RC, Circular Arch	NAVFAC	15-Jul-83	7-Bar	Superceded NAVFAC's original (1954) Standard Drawings 627954 thru 627957, 649602 thru 649605, 658384 thru 658388, 724368, 751861, 764596 thru 764597, 793746 thru 793748, 803060, and 822978 thru 822989. Magazine internal dimensions are 25 feet wide by 80 feet (maximum) length. The magazine has a single entrance with 2 size options for the entrance. Corresponding optional sliding door sizes are: a) 11' 10" wide by 10' high, and b) 17' 10" wide by 10' high. DDESB approval signature of 15 Jul 83 on drawings.
1404375 through 1404389	31-Oct-85	Composite, Circular Arch	NAVFAC	14-Jan-86	7-Bar	Composite circular arch design composed of an internal 10 gage (0.138 inch) corrugated steel arch with reinforced concrete overlay. Magazine internal dimensions are 25 feet wide by 80 feet (maximum) length. Design provides for 2 door sizes: a) 11' 10" wide by 10' high, and b) 17' 10" wide by 10' high. Each door is a single-piece sliding door. DDESB approval signature of 14 Jan 86 on drawings.

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1404390 through 1404398	31-Oct-85	Composite, Oval Arch	NAVFAC	14-Jan-86	7-Bar	Composite oval arch design composed of an internal 10 gage (0.138 inch) corrugated steel arch with reinforced concrete overlay. Internal dimensions are 25'11" wide (measured from base of steel arch) by 20' (minimum) to 80' maximum length. Arch height is 14' 5". Design provides for a single sliding door with dimensions 10' high by 11' 2.5" wide. DDESB approval signature of 14 Jan 86 on drawings.
1404523 through 1404537	30 June 1987, Rev 9 June 1988	RC Box, Type E	NAVFAC	17-Jul-87	7-Bar	Internal dimensions are 50' deep by 94' 8" wide by 13' 8" (rear of magazine) to 15' 10" (front of magazine) high. Three (3) entrances are provided on the headwall. Each of the 3 sliding doors measures 17' 6" wide by 12' high. Sited for 350,000 pounds NEW. DDESB approval signature of 30 Jun 87 on drawings. DDESB memo of 2 February 2006 approved an increase of the maximum, allowable NEW to 500,000 lbs of HD 1.1.
180-25-694	08/21/1978?	RC Box, Type B, Modified	COE, Sacramento Office	22-Aug-89	7-Bar	Hill AFB modified the previously cancelled Navy Box Type B ECM design (NAVFAC Drawings 1404018 through 1404025, to accomodate the storage of large missile motors, by increasing the size of the structure to 102 feet by 117 feet, and going from 3 bays wide and 3 bays deep to 4 bays wide and 5 bays deep. A total of 15 such structures were approved by the DDESB for NEWs of 500,000 lbs each. It appears 13 were initially built, with the remaining 2 being constructed in the late 1990s, with a modified lightning protection system (faraday system with no overhead terminals), as approved by the DDESB on 21 Jan 1998.
180-25-837	6-Feb-07	Updated - RC Box, Type B, Modified	COE, Sacramento Office	9-May-07	7-Bar	In 2006, Hill AFB desired to construct 2 additional modified Navy Box Type B ECM (designed per Drawings 180-25-694, but was unsure if they met current criteria at the time. NAVFAC ESC was asked by the DDESB to review the design to validate if it met current criteria of DoD 6055.09-STD. Their analysis determined that the design did comply, but NAVFAC ESC suggested some minor design improvements to enhance their structural capacities further. Those recommendations were adopted and incorporated into a new drawing package (180-25-837), which was approved by the DDESB. The DDESB approval memo identifies the 2 new buildings as 2329 and 2330, whereas the construction drawings list 1360 and 1361.
33-15-74	11 Apr 79, Rev 3, 11 June 98	RC FRELOC Stradley	COE	22-Jul-80	7-Bar	Internal dimensions are 25' wide by 90' maximum (normally length is 60' or 80') by 14' high (largest clearance at center of magazine). The magazine has a single entrance with 2 door-size options. Corresponding optional sliding door sizes are: a) 8' 10" wide by 8' 3" high or b) 10' 10" wide by 10' 3" high.
33-15-74 (Korean Version)	August 2000/modified March 2006	RC FRELOC Stradley	Korean Ministry of Defense	23 Sep 2003 and 26 July 2009	7-Bar	This design is the approved version of the Republic of Korea Army (ROKA) drawing for 33-15-74, Igloo Type Storage (63 Pyung). The original basis for the Korean version was U.S. Army COE 33-1-74. The Korean drawings assure that all reinforcing steel is electrically continuous. The design specifies the use of a single sliding door which measures 10' 10" wide by 10' 3" high. The previous version of this drawing was approved by the DDESB as a 7-Bar magazine on 25 May 2002. DDESB-PD Memorandum of 26 July 2006 approved design changes which added a mechanical room and several penetrations for the addition of air conditioning.

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421-80-01	5-Feb-88	Steel, Semi-circular Arch	COE	28-Jun-88	7-Bar	Replaced 33-15-73. Drawing permits the use of a 2" deep or 5.5 " deep corrugated steel arch. Internal width and heigth dimensions are approximately 26' wide by 13' 6" high. The minimum internal length is 19', expandable up to the most commonly used magazine length of 89'. The magazine has a single entrance with 2 size options for the entrance. Corresponding optional sliding door sizes are: a) 8' 10" wide by 8' 3" high or b) 10' 10" wide by 10' 3" high.
421-80-03	30-Oct-92	Steel, Oval Arch	COE	28-Dec-92	7-Bar	Replaced 33-15-73. Arch design composed of a 1 gage (0.280 inch) corrugated steel arch. Internal dimensions are 24' wide (measured from base of steel arch) by 21' (minimum) to 89' maximum length. Arch height is 14' 5". Design provides for a single sliding door with dimensions 10' high by 11' 2.5" wide. DDESB approval signature of 28 Dec 1992 on drawings. Thirty-nine ECM based on this design drawing were constructed at Camp Leatherneck, Afghanistan using the CONTECH SUPER-SPAN Mode1102A15-24 High Profile Arch. DDESB approval memo DDESB-PE of 6 Oct 2010 approved the use of this arch as meeting the arch requirements of 421-80-03, thereby considering the ECM as 7-bar structrues.
421-80-05	1-Sep-98	RC Arch	COE	8-Sep-98	7-Bar	Constructed using the Techspan Precast Concrete System, developed by the Reinforced Earth Company, for arch construction. The headwall and door are derived from 33-15-74. Internal dimensions are 25' 11" wide by 90' maximum (normally length is 60' or 80') by 14' high (largest clearance at center of magazine). The magazine has a single entrance with 2 size options for the entrance. Corresponding optional sliding door sizes are: a) 8' 10" wide by 8' 3" high or b) 10' 10" wide by 10' 3" high.
421-80-06 (modified)	10/01/1999, as modified by COE Sketches S-9 through S-13, dated Mar 2002	RC Box	COE/AFSC	17-Apr-02	7-Bar	This design reflects a modified version of 421-80-06, which had been considered as a 7-Bar ECM until its structural rating was downgraded to undefined due to deficiencies in the door design. Modified 421-80-06 (either new construction or retrofitted 421-80-06 ECM) meeting the requirements of DDESB memo of 17Apr 2002, and modified per COE sketches S-9 through S-13, are considered 7-Bar ECM. Internal dimensions are 24' wide by 20' minimum length to 80' maximum length by 11' high. The front wall consists of two hinged doors, each measuring approximately 12' wide by 11' high.
6037-2-5006 to 6037-2-5018	UNK	RC Box	Israel	9-Oct-98	7-Bar (See comments)	This design is for a Box Type ECM provided with 2 entrances. The design does not have substantial blast doors. A retaining wall is positioned in front of the front wall, however, the ECM is not be to considered barricaded. A DDESB-KO Memo of 9 Oct 1998 provided siting criteria for this design, which was brought back by a DDESB survey team that visited U.S. Forces in Israel. It was specified that USAFE (Dominant User for that AOR) would use this information for preparation of a site plan, which would also have to address other requirements of ECM (cover slope and depth, grounding, LPS, etc.) The siting guidance provided by the DDESB was based on a methodology where a constant impulsive loading is maintained on the ECM headwall as NEW and distance increase. For a PES with explosives weights up to 100,000 lbs, site as a 7-Bar ECM (front unbarricaded). When in excess of 100,000 lbs, use the siting guidance contained in the DDESB memo.

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6448522 through 6448554	27-May-97	RC Box, Type D	NAVFAC	5-Nov-85	7-Bar	Superceded NAVFAC 1404465 through 1404478. Internal dimensions are 50' deep by 158' 8" wide by 13' 8" (rear of magazine) to 15' 10" (front of magazine) high. Five (5) entrances are provided on the headwall. Each of the 5 sliding doors measures 26' 3" wide by 12' high. Sited for 350,000 pounds NEW. DDESB approval signature of 30 Jun 87 on original drawings. Sited for 350,000 pounds NEW. DDESB memo of 2 February 2006 approved an increase of the maximum, allowable NEW to 500,000 lbs of HD 1.1.
6448555 through 6448588	27-May-97	RC Box, Type D (HSILS)	NAVFAC	5-Nov-85	7-Bar	Sited for 350,000 pounds NEW. This design is identical to NAVFAC 6448522 through 6448554, Box Type D, except that it incorporates a High Security Integrated Locking System (HSILS). DDESB memo of 2 February 2006 approved an increase of the maximum, allowable NEW to 500,000 lbs of HD 1.1.
6448589 through 6448621	27-May-97	RC Box, Type F	NAVFAC	17-Jul-87	7-Bar	Supercedes NAVFAC 1404541 through 1404555. Internal dimensions are 50' deep by 158' 8" wide by 13' 8" (rear of magazine) to 15' 10" (front of magazine) high. Five (5) entrances are provided on the headwall. Each of the 5 sliding doors measures 17'6" wide by 12' high. Sited for 350,000 pounds NEW. DDESB approval signature of 30 Jun 87 on original drawings. Sited for 350,000 pounds NEW. Sited for 350,000 pounds NEW. DDESB memo of 2 February 2006 approved an increase of the maximum, allowable NEW to 500,000 lbs of HD 1.1.
64990	varies	RC Box	COE, Mobile District	9-Apr-10	7-Bar	The number given under the Drawing Number column reflects the project number only. For actual drawing numbers associated with this design, refer to the DDESB approval memo. Constructed at Eglin AFB, Special Forces Complex. Approximate internal dimensions are 12'6" wide by 20' long by 11' high. There is no headwall and the door spans the front opening.
7978204 through 797231	16-Mar-06	RC Box	NAVFAC	19-Apr-07	7-Bar	Known as the the Type S ECM and designed by the GOJ. The nominal interior dimensions of the storage-bay are 50-feet long by 32-feet wide by 16-feet tall. Access is provided through a single 16-foot wide by 11-foot tall opening in the headwall. This design is rated for a maximum allowable NEW of 500,000 lbs HD 1.1.
7982660 through 7982747	19-Sep-06	RC Box	NAVFAC	4-Jan-07	7-Bar	The subject site plans were originally approved for construction of the 7-bar Modular Storage Magazine (MSM), U.S. Army Corps of Engineers (COE) Drawing 421-80-06, dated 1 October 1999, Sheets S-1 through S-8, Sheets S-14 through S-18, E-1, E-2, and COE sketches (Air Force MSM, Box-Type, dated March 2002) S-9 through S-13. This design upgraded the design to meet seismic requirements for construction at Anderson AFB, Guam. This designed is referred to as the P-3 105 Version of the MSM. A complete description of the design can be found in NAVFAC ESC Memorandum of 29 September 2006, Subject: Blast Analysis of Modular Storage Magazine Modification Andersen Air Force Base, Guam, with Enclosure "Blast Analysis of Modular Storage Magazine Modification Andersen Air Force Base, Guam," SSR-3 144-SHR Revision (A), September 2006.

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7986314 through 7986342	23-Apr-07	2-Bay, RC Box with NPW	NAVFAC	13-Sep-07	7-Bar	Known as the Type HP-2B ECM and designed by the GOJ. The Type HP-2B magazine has two storage-bays separated by a 22-foot thick non-propagation wall. The nominal interior dimensions of each storage-bay are 50-feet long by 32-feet wide by 16-feet tall. Access to each storage bay is provided through a single 16-foot wide by 11-foot tall opening in the headwall. Approved by the DDESB (with conditions for use) at MCAS Iwakuni, Japan only, for storage up to 45,000 lbs NEW, dependent on SG being stored in the bays. Refer to DDESB Memorandum. The Japan Maritime Self-Defense Force (JMSDF) Type HP-2B version is identical.
7988502 through 7988531	7-Dec-07	RC Box	NAVFAC	22-Apr-08	7-Bar	Known as the Type L ECM and designed by the GOJ. The Type L magazine is a single-bay magazine with nominal interior dimensions of 96-feet wide by 50-feet long by 16-feet tall. The roof is supported by two interior columns. The headwall is nominally 96-feet wide. Access to the magazine is provided by three 25-foot wide by 11-foot tall openings in the headwall. The GOJ used NAVFAC Drawing Nos. 1404430 through 1404444 for guidance in their design of the Type L magazine. NAVFAC ESC SSR-3247-SHR, "Blast Analysis of the Type L Magazine MCAS Iwakuni Japan," of January 2008 documents the blast analysis of the design. The L-Type design was approved by the DDESB at MCAS Iwakuni, Japan only, for storage up to 45,000 lbs NEW.
* Munitions Storage Magazine (MSM)	May-02	RC Box	Hill AFB	11-Jul-02	7-Bar	This 14-foot ceiling height Munitions Storage Magazine (MSM) design was developed for construction of magazines 2580 and 2581 at Hill AFB, Ogden, Utah, and is basically a larger version of the MSM (11-foot ceiling height) shown on Drawings 421-80-06 (Undefined) and 421-80-06 (modified) (7-Bar). Internal dimensions are 24' wide by 14' high by 80 feet long. A total of 40 MSM (14') are planned to be constructed at Hill AFB. Two have been constructed at RAF Lakenheath, United Kingdom, with drawings converted to metric (reference DDESB-PE memorandum of 5 April 2006, Subj: Expeditious Final Approval Request, Construct Explosives Operating Location and Two Earth-Covered Magazines, RAF Lakenheath, United Kingdom (USAFE-Lakenheath 04-S5 through S7)).
High Performance Magazine (HPM)	Preliminay Design dated 3 July 2001	RC Box (multi-cell)	NAVFAC	27-Jan-00	7-Bar	Additional information on the Navy's HPM can be found in paragraph C2.3.13. The HPM design concept was granted DDESB approval as a 7-Bar magazine during the 319th Board Meeting of 27 January 2000. A preliminary design document, dated 3 July 2001, is available from NAVFAC. The HPM consists of four separate ordnance storage bays that are treated as independent magazines (i.e., independent MCE). Each storage bay can store up to 30,000 lbs of NEW. Each bay can optionally be subdivided into two separate storage areas with the use of the "Re-locatable" Modular Wall. Each subdivided storage area can also store up to 30,000 lbs of net explosive weight, thereby increasing the total storage capacity of the HPM. The separation of the storage bays or subdivided storage areas also allows for the storage of incompatible ordnance in adjacent bays. The maximum storage capacity of a HPM with no subdivided bays is 120,000 lbs net explosive weight (NEW). If all four bays are subdivided, the maximum storage capacity is 240,000 lbs NEW.

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B3325 Ready Magazine	6/24/08	RC Box	NAVFAC	25-Aug-08	7-Bar	Five of these magazines were constructed at NSWC Crane, Indiana, in a unique design that incorporates parts from a number of other 7-Bar designs: (a) The ECM is the same width and height as the original MSM (interior dimensions of 25 ft wide by 11 ft high). The interior length is 96 ft (vice the maximum length of 80 ft as allowed in the original MSM design); (b) The ECM doors will be those approved for the 7-bar version of the 11-ft high MSM design (identified in TP-15 as "421-80-06 (modified)"); (c) The side and back wall panel characteristics are most similar to the "421-80-06 (modified)" design. The roof panel characteristics are most similar to the 14-ft high MSM design approved for Hill AFB (identified in TP-15 as "Modular Storage Magazine (MSM)"); (d) The connections between the roof panels, between the roof and wall panels, and between the wall panels and foundation, were modified as approved for Guam (Andersen AFB drawings 7982660 through 7982747) to meet seismic requirements. A topping slab was also added as approved for Guam, but the thickness of the slab is greater, and it will be sloped to aid in water drainage; (e) The front ventilator in the original MSM design (which exited via the side wall and vented vertically) was replaced with two vents (one from each side wall that now vent out of the wing walls) using the ventilator design from the Navy Type-E ECM. The rear ventilator in the original MSM design (which exited via the rear wall and vented vertically) was replaced using the ventilator design from the Navy Type-E ECM (which exits via the rear wall and vents vertically); and (f) the multiple air terminal system in the original MSM design was replaced with the design from the Navy Type-E ECM, which has only a single air terminal on the rear ventilator.
AF Segregated ECM Design	See Note 5	RC Box	COE/Mobile District	9-Apr-10	7-Bar, See Comment section.	Each RC box type ECM has internal dimensions of approximately 12' wide by 19' long by 11' high. The design consists of multiple such ECM sharing a common headwall and separated by earth at K1.25 separation distance being maintained between magazines. Each ECM is limited to a maximum NEW of 30,000 lbs, with the K1.25 distances adjusted to reflect the largest NEW used in adjacent magazines. See Note 5 below for the associated, approved design drawings.
Munitionslagerhause (MLH) 90B	UNK	RC Box	German	12 Dec 77/18 Aug 87	7-Bar, See Comment section.	NATO explosives safety standards limit this magazine to an HD 1.1 NEQ of 75,000 kg (NEW=165,000 pounds). For siting at U.S installations, where encumbered land is completely within U.S owned or controlled property, an explosives limit of 250,000 pounds NEW can be used for siting purposes and treat as a non-std ECM. Considered a standard (7-Bar) ECM for sitings involving 165,000 pounds NEW or less.
Munitionslagerhause (MLH) 90S	UNK	Steel, Oval Arch	German	12 Dec 77/18 Aug 87	7-Bar, See Comment section.	NATO explosives safety standards limit this magazine to an HD 1.1 NEQ of 75,000 kg (NEW=165,000 pounds). For siting at U.S installations, where encumbered land is completely within U.S owned or controlled property, an explosives limit of 250,000 pounds NEW can be used for siting purposes and treat as a non-std ECM. Considered a standard (7-Bar) ECM for sitings involving 165,000 pounds NEW or less.

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Munitionslagerhause (MLH) 180B	Jul-88	RC Box	German	12 Dec 77/18 Aug 87	7-Bar, See Comment section.	NATO explosives safety standards limit this magazine to an HD 1.1 NEQ of 75,000 kg (NEW=165,000 pounds). For siting at U.S installations, where encumbered land is completely within U.S owned or controlled property, an explosives limit of 250,000 pounds NEW can be used for siting purposes and treat as a non-std ECM. Considered a standard (7-Bar) ECM for sitings involving 165,000 pounds NEW or less.
Munitionslagerhause (MLH) 180S	Sep-76	Steel, Oval Arch	German	12 Dec 77/18 Aug 87	7-Bar, See Comment section.	NATO explosives safety standards limit this magazine to an HD 1.1 NEQ of 75,000 kg (NEW=165,000 pounds). For siting at U.S installations, where encumbered land is completely within U.S owned or controlled property, an explosives limit of 250,000 pounds NEW can be used for siting purposes and treat as a non-std ECM. Considered a standard (7-Bar) ECM for sitings involving 165,000 pounds NEW or less.

Notes accompanying Table AP1-1:

1. Each line represents a separate ECM design. Where UNK appears, it indicates that no information was found for that particular field.
2. 7-Bar and 3-Bar ECM are permitted to store up to 500,000 pounds NEW of HD 1.1, unless otherwise noted.
3. There are currently no 3-Bar ECM approved for new construction.
4. No HPM, other than a test magazine, has been constructed. Construction drawings must be finalized and approved by the DDESB prior to construction start. The HPM design consists of multiple cells, which use NPW technology to prevent propagation of an incident to adjacent cells. Therefore, the MCE and QD associated with the HPM are based on 60,000 pounds NEW vice the total quantity of explosives stored in all cells of the HPM. Specific mixing and compatibility criteria will apply to storage of ammunition within each cell. As part of the approval, all HD 1.1 and 1.2 AE are placed within five possible HPM Sensitivity Groups. The Joint Hazard Classification System (JHCS) identifies these groups, which define what can be stored together in an HPM. The HPM is not an ECM. The HPM is earth-bermed (except for the truck entrance) and moveable RC lids form the roof of each storage cell. The area above the storage cells is enclosed by a lightweight metal panel building, within which is contained the crane that is used for AE movement in the HPM.